Darwin’s Impact

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Abstract

The nineteenth century had a profound influence in the field of science, religion, and philosophy. The religious views of the revealed religion rooted in the Biblical Inerrancy were questioned by the belief in law-bound natural religion as early as the middle of fifteenth century by the proposal of heliocentric universe by Copernicus. Aristotle’s [1] method based on his teleology could dominate scientific research in animals and plants even in

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[1] Third century BC philosopher, scientist and biologist

the nineteenth century. Reviewers[2] of Charles Darwin agreed on the fact that his methods were mostly friendly rather than antagonistic with those of Aristotle. Middle of sixteenth century sees Kepler's discovery of planetary orbits, and the seventeenth century sees Newton's laws of motion complementing the law-bound nature of matter in motion which led a war against the from Design Principle of revealed religion. Eighteenth century attempts to explain geological evolution on the basis of the uniformitarian principle proposed by James Hutton and supplemented by Charles Lyell. Darwin's theory of natural selection was largely influenced by Lyell. Darwin during the Beagle Voyage often referred to himself as a geologist. In the middle of nineteenth century, the discovery of gene produced direct evidence for Darwin's theory of natural selection. The major aspect the article intends to bring out is that Darwin is instrumental in establishing a method against the from Design view held until then. This paradigm shift attracted vehement criticism from theist quarters in the same way as Copernicus, who lived in the fifteenth sixteenth centuries, was at the centre of controversy in his time. Darwin does strengthen Biology by his method the same way as Copernicus strengthens physics. Even when Aristotle was often attacked for endangering the progress of science (on the basis of his methods of investigation of species), there existed a friendly connection between his and Darwin's methods. Darwin's natural selection is so powerful to influence scientific thought processes. The gene discovered close to the beginning of twentieth century is by far the sharpest evidence in support of Darwin's theory. Darwin's approach towards the Bible, Natural Theology and Social Science influenced church's attitude towards revealed aspect of religion.

1 Prologue

Mid nineteenth century to end twentieth century is an eloquent period for evolutionary biology. The period begins with Darwin's publication of Origin of Species and progressed to Leigh Van Valen's serious proposal regarding *HeLa* cells and HPV virus. The latter just establishes the core aspect of Darwin's theory in the sense that HeLa cells have a separate evolution from humans which defines a new species, an aspect that provides a direct evidence for Darwin's theory. The century is busy establishing the basic unit of life, the cells. Comprehending the history of evolutionary biology, one necessarily adores the vision of Charles Darwin in drafting the principle of evolution sans a knowledge about the basic unit of life. Darwin draws his conclusion based on the current knowledge base available then from fields as wide as geology, plants and animal sciences, economics, and astronomy to name a few. He contradicted himself from the current facets of theology, Biblical Inerrancy, the teleology based on the from Design (of God) principle, and even of evolutionary principle based on independent separate channels. The wide acceptance that his theory obtained is indicative in the fact that we currently have political, social and economic Darwinism. The theory was so influential that the tenets of philosophy, religion and atheism underwent drastic changes in their focus. Darwin himself attempted disengaging himself from belief in Christianity in his later life.

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[2] Aristotle and Darwin: Antagonist or Kindred Spirits - James G Lennox, Philosophic Exchange vol 46, number 1

2 Introduction

Evolution - Biology and Religion

1. On Biology: *Nothing in biology makes sense except in the light of evolution - Theodosius Dobzhansky*[a]
2. On Christianity: ....*the distinction between Christianity and theist natural religion, which Darwin himself maintained in writing on his beliefs is largely neglected.- James R Moore.* [b]

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[a] Dobzhznsky is a strong supporter of Darwin's theory.

[b] in opening paragraph "Of Love and Death - Why Darwin gave up Christianity" - History, humanity and evolution - Essays for John C Greene.

Darwin followed a naturalist approach in his research. Philosophy, religion and science were closely linked with knowledge acquisition. In the west every piece of knowledge invariably was scrutinized by the pillars of religion.[3] Atheism influenced philosophy and science, but all philosophers were definitely not atheists. Natural philosophers often believed in a deity worship, but seldom did they accept the fact that every thing existed as god's design. Aristotle's teleology influenced even the nineteenth century research.[4] Locke and Hume establish the principle of reasoning in research currently recognised as natural philosophy. Even their propositions do not rule out the supremacy of god because ultimately the from Design alternative pops out in analysis. Darwin's approach in identifying origin of species[5] has its merit in the sense that it is a naturalist approach all encompassing the vast contents of biological data available then. The reviewers of Darwin who accepted his principle of evolution had often viewed Aristotle's approach being friendly with Darwin's approach, not antagonistic. Many have also expressed the view that the method followed by Aristotle (which required identifying essential characteristic in studies and classification) is primarily flawed to such an extent that it halted scientific progress.

3 Darwin's voyage into the past

3.1 The Beagle Voyage

Darwin participated in Beagle Voyage[6] when he was 23. Darwin believed the kinds of life existing on earth in the present had a single kind of life as its ancestor and became different as they gradually took over the earth, its air and its waters.[7] In fact Lyell's application of James Hutton's[8] uniformitarianism doctrine applied to life gave rise to the principle of evolution. Darwin's careful observations while on this voyage influenced the two books that Darwin wrote later.[9]

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[3] Religion was divided into two categories, natural and revealed. Natural religion used tools in enquiring the causes, whereas revealed religion stream accepted the supremacy of god de facto.

[4] Aristotle's teleology describes a method of research based on four questions what, when, where and why. Since the why (the *final* in Aristotle's version) questions' answers often led to other why questions leading again to the "from Design (of god)", later researchers attempted finding answers for how rather than why.

[5] Vehement criticism (of church) ensued consequent to Darwin's attempt to trace evolution to human beings which forced Darwin to postpone this aspect to a later time

[6] a five year world cruise on HMS Beagle to study plants and animals. Refer: Evolution - Ruth Moore - Time Life International.

3.2 Darwin and Christianity

Theist or Agnostic

Darwin's reply (to John Fordyce) to the question, "Can a theist also be an evolutionist?" was: "*Whether a man deserves to be called a theist depends on the definition of the term.........I have never been an atheist in denying existence of god, I think that generally but not always, that an agnostic would be the more correct description of my state of mind.*[a]

[a] Why Darwin gave up Christianity - J R Moore in "History, humanity and evolution - Essays for John C Green;

The most authoritative account of Darwin's loss of faith in Christianity appears in his manuscript originally not intended for publication, but published later to his death. Darwin gradually happened to distrust the old testament after Beagle voyage on account of historical evidence he gathered during the voyage. He carried Lyell's book with him during Beagle voyage, and believed in Lyell's ideas of geographical evolution. Darwin wrote about natural religion and morality at length in his autobiography. Darwin grew up with a rich academic and research background. Ruth Moore[10] mentions how Darwin's theory established a milestone in cosmogony[11] at large.

4 Darwin's Dangerous Idea - Natural Selection

Natural Selection and Origin of species

1. On Natural Selection - A statement of open challenge
   If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous successive slight modifications, my theory would absolutely break down[a].

2. On Origin of Species
   If Darwin had published his Origin of Species under its existing title today, he would have been in trouble with Trades Descrip-

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[7] Darwin was greatly influenced by Lyell's application of James Hutton's doctrine of uniformitarianism to geological evolution which attempted to conclude that gradual geological processes shaped earth's surface gradually.

[8] often referred to as father of modern geology

[9] On the Origin of Species (1859) and The Descent of Man (1871).

[10] Evolution, a Time Life publication, with a short forward by Theodosius Dobzhzansky, provides a striking account of the environment which led Darwin into his theory. The book describes events, encounters and personalities that influenced Darwin throughout his academic and research career. This short lucid outline provides a breakthrough into Darwin's theory and its making.

[11] with reference to origin of life in universe. Cosmogony has special reference to the solar system when used stand alone.

tion Act, because if there is one thing the book is not about is the origin of species[b].

3. Natural Selection Unifies Adaptation and Diversity
The generation of adaptation and the generation of diversity were different aspects of a single complex phenomenon, and the unifying insight was the principle of natural selection[c].

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[a] Charles Darwin on Natural Selection - Origin of species

[b] Steve Jones, geneticist in 1993

[c] Darwin's Dangerous Idea - Evolution and the Meanings of Life - Daniel C Dennet

Darwin describes Natural Selection without any reference to origin of species. While Natural Selection is all about adaptation with reference to survival by inheritance, Darwin makes an attempt to explain speciation as if he does not propose to explain origin of life. Purporting explanation Darwin begins mid stage to conclusively state that all species have a common origin by way of inheritance. He is very much emphasizing the point by numerous successive slight modifications over enormous periods of time. In fact he was confident of his proposal in that he offers a challenge for investigators to demonstrate a single instance of any complex organ existing that could not be formed by successive slight modifications. Such a challenge had been taken up by various investigators without any success. Darwin's limitation in this case is well understandable in the sense that he did not have any evidence of a basic unit of life , a concept that would be well established half a century later. The foresight with which Darwin proceeded in this regard is superior. One recognises the fact that Darwin's principle is not one of evolution, but evolution with the backbone of natural selection.

Darwin on Aristotle

Linnaeus and Cuvier have been my two gods, though in very different ways, but they were mere school-boys to old Aristotle.[a].

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[a] Darwin after reading "On the parts of animals" by Aristotle

Darwin followed a naturalist approach. His studies and careful observations allowed him to emphasize a clear cogent and versatile way to answer the why questions of Aristotelian teleology. This approach ruled out all alternate ways proposed by Locke and Hume in that his method did not digress to the traditional from Design conclusion regarding the origin of species.

5 1950s - *The Hela Cells* - Immortality and Evolution

5.1 On Cervix Cancer

Henrietta Lacks was admitted to Johns Hopkins hospital on account of severe pain. The examination indicated cancer of the cervix, a common occurrence that time warranting research in order to treat this kind of cancer. The hospital removed heathy and affectd cells of the cervix as a part of biopsy. These cells would become famous later as HeLa cells[12] in the history of cancer research. The hospital supplied the cells to any organization requesting this for research. The cells were cultured, which unlike the other normal cells grew at a fantastic rate typically doubling in twenty four hours.

5.2 Nuremberg Code - Informed Consent

By 1910, the American Medical Association had rules to adhere to protecting laboratory animals being used as specimens in research, but no such rules existed for humans. *The Hippocratic Oath* existent as early as fourth century BC is an oath taken (in the name of several gods) by medical professionals regarding ethical practices, but this did not mention an *informed consent* on the part of the human subject. Nuremberg Code (framed in 1947 August) was the first to mention an *informed consent.* Even when Germany and Europe in general accepted Nuremberg Code, doctors in America either believed it unnecessary, or were ignorant about such a code with the result that human consent was not taken in the case of administration of HeLa cells in humans, many of them prisoners being treated for cancer, in the hope that eventually a treatment for cancer was possible in the near future. Around 1980s many cases were heard in courts regarding the absence of human consent. Even in 1951, when HeLa cells were removed, cultured and later distributed, no record of a human consent was existent, and Johns Hopkins Hospital never knew such a consent was necessary at that time. The hospital never made profit out of HeLa cells, but instead encouraged a lot of funding in the name HeLa. The cells were distributed for research in several parts of the world, and even been carried in space to study cell division in space.

5.3 HPV Virus - Cell Immortality

HeLa Cells and Evolution

1. *HeLa Cells - A New Species?:* HeLa cells are evolving separately from humans, and having a separate evolution is what a species is all about - Leigh Van Valen, evolutionary biologist in early nineties.[a]

2. *On HPV -18 virus Strain:* HeLa cells in lab tested positive for the HPV-18 strain. Not only that, the original sample that was ordered from Henrietta's biopsy didn't just test positive; it showed that Henrietta had been infected with multiple copies of HPV-18 - Harald zur Hausen[b]

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[a] The original sample of Henrietta's cervix put into culture had given rise to many tons of other cells, all still known as HeLa cells, but all slightly different from one another - a condition that Darwin puts in his natural selection.

[b] Hausen was honoured by a Nobel prize for the finding that the HPV DNA being blocked, cervical cancer cells stopped being cancerous, which would help lead to an HPV vaccine.

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[12] HeLa stands for *He*nrietta *La*cks, as the convention then was to code laboratory specimens using the two letters of primary and secondary names. Immortal Life of Henritta Lacks - Rebecca Skloot

In the early twentieth century HeLa cells were being used for research originally in studies related to cancer of the cervix, but later to studies related to human life extension. Scientists tried for decades to grow immortal cell lines using normal cells instead of maligned ones, but it never worked. HeLa cells seemed to answer the question of mortality of cell lines because they grew and grew multiplying for ever in cell cultures. Normal cells divide only a finite number of times before they reached a limit about fifty times[13]. In contrast to this, cancer cells grew indefinitely. A scientist at Yale, using HeLa cells, demonstrated that human cancer cells contain an enzyme called *telomerase* that rebuilds their *telomers*[14].

6 Darwinism - Socio-economic-political Impact

Darwinism in Human Societal Dynamics

1. *On Physical Fitness in Survival:* Initially survival of the fittest referred to the physical fitness of any organism to survive against all odds, but later was used to justify certain social, political or economic dynamics taking place in the human society - Daunting Darwinism KT Chandy in an article.[a]
2. *Class Struggle and Darwinism:* Darwinism provides a basis for historical class struggle - Karl Marx on Darwinism[b]
3. *On Acceptable Choice:* Either we must accept the doctrine of transmutation of species...of one geological epoch transmuted into those of another by some long-continued agency of natural causes; or else believe in many successive acts of creation and extinction of species out of .....what we may properly call miraculous - William Whehwell[c]

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[a] article in Indian Currents
The author is a retired professor, XIM Bhubaneswar. The article describes social, political and economic Darwinism in the light of Indian Caste System, Brahmanism and Hindutwa and of the eugenics of Adolf Hitler.

[b] Marx and Engels.....and Darwin - Ian Angus
The article explains how Marx and Engels supported Darwin's theory of evolution and natural selection and how teleology is dealt a mortal blow by Darwin's theory.

[c] A British polymath who influenced Darwin among many others like Charles Lyell, John Herschel

Mining and canal building boomed in the eighteenth century which exposed abundant geological layers and ancient fossils for research which established beyond doubt that the earth was millions of years old much larger than what Genesis[15] accounts for. Charles Lyell, a geologist who believed in Hutton's uniformitarianism believed that the earth's crust evolved through gradual processes on the basis of known natural laws over a very long interval of time. Charles Darwin was greatly influenced by Lyell's theory during the Beagle Voyage of which Darwin was a member who described himself as a geologist most of the time in research during this time. Darwin also associated himself with Herschel, a known astronomer, during this voyage. The Beagle voyage provided an investigative framework for Darwin's theory of evolution exemplified in his two books, the origin of species and origin of man. Lamarck's principle of evolution of species differed from Darwin's in the sense that Darwin's was more dynamic than Lamarck's. While Lamarck believed the organs used more by a species contributed better survival and hence were passed on to the offspring, Darwin framed his theory on the assumption that the alternate ways in which the members of a species could compete each other would provide more chances of survival or less chances of survival. The more chances of survival would gradually turn into a different species over a long period of time, and in the other case a species will move towards extinction. Darwin believed that all species currently seen are part of a species line already existent, many of the species have already gone extinct because they could not cope with the survival. The more the variations present in a species, the more is the choice for natural selection open for survival. The law of natural selection is in its real sense a law of statistical nature. Darwin was expressive of the fact that the change however small will require enormous amount of time to explicitly surface to our senses.

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[13] This number is known as Hayflick Limit after Leonard Hayflick who published his paper in 1961

[14] A string of DNA s at the end of each chromosome. Telomers shortened each time a cell divided so that when they are almost gone, the cell begins to die. Telomerase in human cancer cells rebuilds the telomers to make cells immortal. The presence of telomerase meant cells could regenerate their telomers indefinitely. Hence HeLa cells are immortal!

[15] The book of Genesis opens the Hebrew Bible, the e Old Testament in which the creation of the world is described as a revelation

7 Epilogue

Darwin's theory of evolution had profound impact in almost all walks of life; social, political, economic to name a few. Its impact on religious thoughts and atheism is so profound that Darwin himself gave up Christianity in his older age and also forced the church to amend its traditional stance towards the revealed aspects of the religious matters. The twentieth century research in biological sciences addressed the basic questions regarding the world of micro organisms, their growth, subsistence and extinction in a highly constructive manner. The tremendous breakthroughs such researches brought in the fields of bacterial and viral diseases and their treatment would be made possible only through the basic principle of evolution, variation and natural selection. Such breakthroughs contributed much to the existence of human beings surpassing the onslaught of pandemics time and again in human history. The HPV, HIV research has opened new inroads into control and management of such viral onslaughts. The genetic engineering, identification and prevention of genetic defects at very early stages are made possible by design and engineering of instruments accessible even to common people.

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